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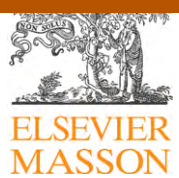

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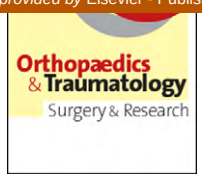

ORIGINAL ARTICLE

Can Blount's disease heal spontaneously?

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KEYWORDS
Blount's disease;
Infantile tibia vara;
Bowed legs

Summary
Introduction: In stage 1 of all currently accepted classifications for infantile tibia vara, the diagnosis is difficult between physiological bowing and true Blount's disease. There is no evidence of prognosis criteria for surgical treatment at this stage.
Patient and methods: We retrospectively studied a series of 26 patients born in the Indian Ocean area, presenting at stage 1 of the disease, in order to determine whether any of them were likely to heal without treatment.
Results: It was found that children seen at stage 1 of infantile tibia vara have a one-in-three chance of healing spontaneously.
Discussion: An alternative classification in three stages could then provide more suitable therapeutic indications: stage 0: possible Blount's disease (patient older than 2.5 years); stage 1: certain Blount's disease, active physis (+) (progressive varus, age >3 years, typical image with no epiphysiodesis bridging); stage 2: certain Blount's disease, inactive physis (—) (superomedial tibial bony bridge).
Level of evidence: Level IV. Retrospective study.

Introduction

The Langenskiöld's classification (Fig. 1) [1], widely adopted in infantile tibia vara, is simply a radiological classification. It was improved by the Smith's classification in four stages [2], then by the Fort-de-France six-stage classification [3]. In stage 1 of all these classifications, the differential diagnosis with physiological genu varum is difficult to make. It is based on the radiological presence of dense and inhomogeneous medial metaphyseal beaking found only on the tibia. This image is not always typical. Many cases exist in which the diagnosis of infantile tibia vara can be made too easily, resulting in inappropriate osteotomy. There are also intermediate forms where the radiological image, although suggestive, is not followed by the expected aggravation of internal tibial torsion (TT) varus deformity. In 1966, Blount's himself wrote: ''untreated osteochondrosis deformans tibia will likely become worse and go on to severe bowleg, but this is not always true'' [4].

It is these beginning forms that we wished to investigate in an attempt to detail the criteria that would allow us to propose early treatment with the hope of definitive recovery.

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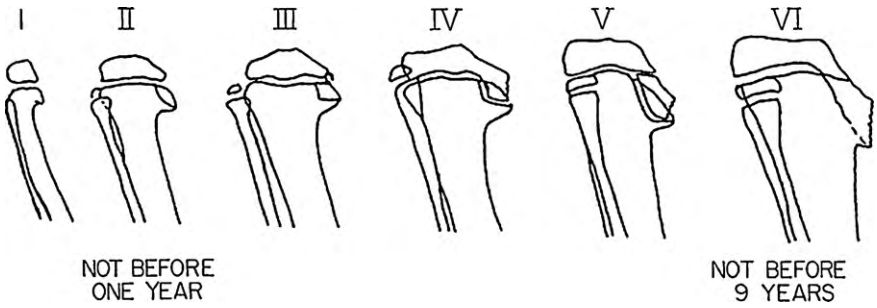

Figure 1 Langenskiöld's radiological classification.

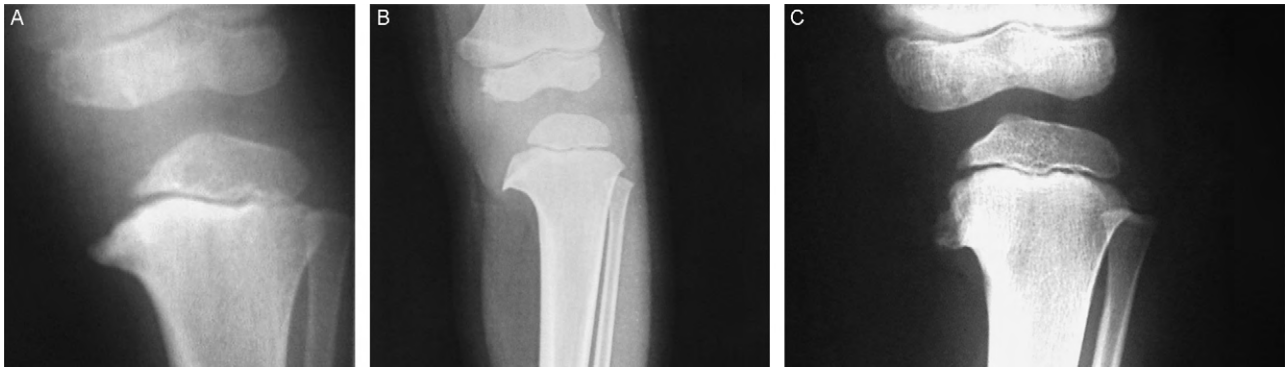

Figure 2 Radiological images of Blount's disease. A. Metaphyseal beaking (B). B. Metaphyseal beaking and depression (BD). C. Metaphyseal beaking, depression and morseling (BDM).

Patient and methods

Between 1990 and 2003, all the patients seen at stage 1 were selected. Their ethnic origin was studied as was their body mass index (BMI), calculated according to the WHO and International Obesity Task Force criteria. Clinically, ligament laxity in the varus knee was defined as present or absent. The x-rays were described and classified into three types: medial metaphyseal beaking (B) (Fig. 2A), beaking with depression of the tibial plateau (BD) (Fig. 2B), and beaking with depression of the tibial plateau and morselized bone or clear images (BDM) (Fig. 2C). The following angles were measured: the mechanical femorotibial angle (FTA) on a long-leg film with load, the anatomical lateral distal femur angle (aLDFA), the Levine's and Drennan's metaphyseal-diaphyseal angle (MDA) [5,6], and medial tibial slope (MTS) [7—9] on an AP x-ray in the neutral rotation position. TT was evaluated clinically by the angle formed by the bimalleolar axis and the knee flexion plane. We did not perform MRI on these patients since this had been done by Mukai et al. [11]. Treatment consisted in valgus derotation subperiosteal osteotomy, stabilized with a short-leg cast or cross pin fixation. Aponeurotomy of the anterolateral compartment was performed preventively in all cases. Progression was monitored clinically and radiologically using the same angle criteria as in the diagnostic phase. The results were classified as good (normal and symmetrical FTA, TT between 10 and 25°), fair FTA less than 5°, TT less than 5°) or poor (residual varus, TT negative).

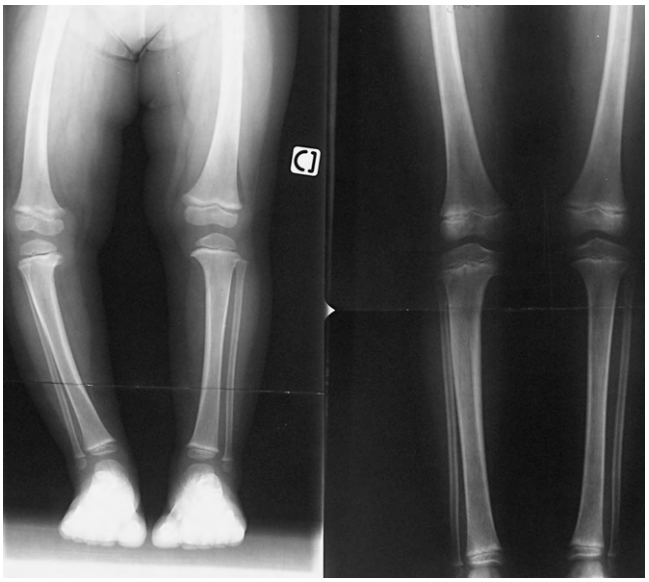

Figure 3 Spontaneous favorable progression of a stage 1.

Results

Of the 32 files, 26 were retained (13 females and 13 males) seen at a mean age of 3 years (range: 1.5—7 years). The patients were monitored every 6 months. The mean follow-up duration was 6 years (range: 3—16 years). Bilateral involvement was found in 13 cases and unilateral involvement in 13 cases. All the children were born in the Indian

Table 1 Disease progression.

Spontaneous evolution	Children	Tibias
Favorable	10	14
Unfavorable	13	21
Operated on before evolution	3	4
Total	26	39

Ocean area. Seven of them came from the Seychelles, 10 from Reunion Island, and nine from the Comoros. The mixed origins of the populations in this zone made it impossible to retain any ethnic criteria. The mean BMI was 16.6 and was nearly identical in both the favorable and unfavorable progression groups. Varus laxity of the knee was noted in the five oldest children and always regressed with spontaneous or postsurgical healing.

Of these 39 tibia vara, 25 showed the B radiographic profile, nine the BD profile, and five the BDM profile. The mean femorotibial angle was 20.2° (range: 0—45°). The mean aLDFA was 92.2° (range: 89.2—93°). The mean MDA was 19.8° (range: 4—48°), and the tibial slope was always within normal limits. Internal TT was a mean 20° (range: 0—45°). Excluding three cases (four tibias) operated with no proof of progression, progressive improvement of the angles was observed in 10 children (14 tibias) (Figs. 3 and 4) and worsening in 13 children (21 tibias) over a mean period of 1 year (Table 1). All the cases that evolved unfavorably (including three cases with no proof of progression, for a total of 16 children) were treated and the results were classified as good in 15 children, fair in one child, and never poor. One patient relapsed over time, with the appearance of medial epiphysiodesis requiring surgical revision.

In the group experiencing spontaneous healing (mean BMI: 16.6), the radiological profile was type B in nine cases, BD in four cases, and BDM in one case. The mean FTA was 21.5° and the MDA was 19.4°. In the group of evolving cases (adding the three cases operated with no proof) (mean BMI: 16.8), we found 16 B, five BD, and four BDM; the mean aLDFA was 20.3°, and the MDA was 20°. We attempted to find a correlation between the radiological aspect and the FTA and MDA at the first consultation. In two cases, there was a clear relation between these data, but not in the others. However, there was a clear correlation in all the cases in relation to progression. The radiological profile evolved naturally with age: the image normalized in the cases undergoing spontaneous healing and it tended to worsen in the others. This is particularly true for the FTA and MDA measurements at 3 years of follow-up, decreasing 5 and 8° for the cases with spontaneous favorable progression.

Discussion

Based on these results, several questions can be raised.

Can certain cases of Blount's disease heal spontaneously?

Langenskiöld [10] cites this possibility in cases of varus over 20°. Shinohara et al. [12] found 22 cases of spontaneous healing of infantile tibia vara with the MDA greater than 11°, but without the Langenskiöld's profile 2 or 3. The MDA described by Levine and Drennan alone is therefore not a sufficient criterion for diagnosis [5]. The radiological aspect may therefore be indispensable. However, out of 24 tibia vara associating a Langenskiöld's 2 or 3 radiological profile and a MDA greater than 11°, 18 healed spontaneously within 6 years [12]. The combination of radiological profile and MDA greater than 11° is also insufficient to conclude in the non-reversibility of the disease, which is confirmed by the present series.

Mukai et al. [11] differentiated two groups based on the presence or absence of an abnormality in the perichondral signal on the medial proximal tibia on T2-weighted MRI sequences taken between the ages of 18 months and 3 years. Only five patients out of 11 of the group presenting this signal abnormality evolved toward typical images of Blount's disease.

One must therefore accept that, despite a MDA over 11°, despite an image typical of Langenskiöld's stage 2 or 3 Blount's disease or BD/BDM, and despite an abnormality of the medial physis on MRI, certain cases of Blount's disease can evolve spontaneously toward resolution. This is confirmed by the review of our cases and may indicate, without there being proof, that many of the cases of healing obtained by orthotic treatment are actually cases that spontaneously evolved favorably [13]. Finally, no overweight factor could be demonstrated.

Must the diagnosis of Blount's disease absolutely include the notion of aggravation or is it simply a radiological diagnosis?

This question cannot be answered satisfactorily since the pathophysiology of this disease remains uncertain. The histological abnormalities are not specific, but there is an ethnic factor, a familial factor, and a mechanical factor [14]. Generally, a disease is defined as an ''entity in opposition to health, whose negative effect is due to an alteration or an imbalance of a system at any level of the physiological or morphological state considered normal, balanced, or harmonious''. The simple observation of an axial deviation of the tibia associated with an abnormal radiological image can therefore be considered a disease. Although spontaneous healing produces few negative effects, the notion of aggravation is not a priori indispensable. Consequently, to suggest the diagnosis of Blount's disease, the following criteria should be present:

- a child aged at least 2.5 years, since none of our patients was treated before this age;
- isolated involvement of internal tibia torsion deformity;
- typical image of medial metaphyseal beaking.

However, to be sure that treatment is required, clinical and radiological proof of aggravation of the deformity should be observed, because certain cases of Blount's disease can heal without treatment. In our series, three patients were operated at the age of 2 years and 6 months, with no proof of evolving disease; it could be considered that statistically they had a 37.8% chance of healing spontaneously.

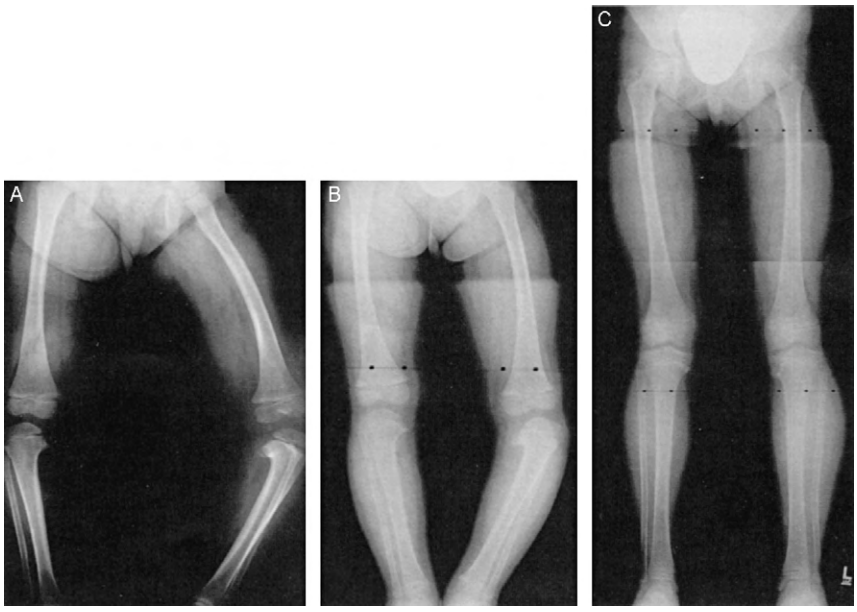

Figure 4 Spontaneous favorable progression of a case of Langenskiöld's stage 2.

Given that only one of our patients, operated at the age of 5 years, evolved toward relapse, there seems to be little risk involved in prolonging observation for 6—18 months.

Do the classifications used today accurately reflect actual cases?

Stricker et al. [15] underline the imprecision of the Langenskiöld's classification after having tested the responses of six pediatric orthopaedists assessing 60 radiographs of infantile tibia vara. Langenskiöld himself said, in 1981 [16], that ''the description of stages 1—4 as the development of radiographic changes with age has no relation with prognosis and treatment''. Measurement of MTS has no other value than for advanced cases of Blount's disease with medial epiphysiodesis, because depression of the medial plateau is only radiographic in the other cases, as underlined by Staniski et al. [17].

In stage 1 cases in various classifications, there are no radiological criteria that can predict the progression of Blount's disease. Only follow-up will show whether angle deformities and radiographic images evolve, without there being a clear match between these images and the severity of the disease. This is why we have proposed a classification (Fig. 5) that takes both age and progression into account [8]:

- stage 0: Blount's disease possible (internal torsion tibia vara, child younger than 2.5 years, radiographic image present but not typical);
- stage 1: Blount's disease certain, active physis (+) (age >2.5 years, typical image, progressive, no epiphysiodesis bridging);

Figure 5 Author's classification: A: stage 0; B: stage 1, active physis (+); C: stage 2, inactive physis (—) normal plateau, D:stage 2, inactive physis (—) inclined plateau.

- stage 2: Blount's disease certain, inactive physis (−) (medial bony bridge), in which two subtypes can be distinguished: medial plateau normal, medial plateau inclined.

Conclusion

In a population from the Indian Ocean area, the association of tibia vara with medial TT and an image of superomedial tibial metaphyseal beaking in a child younger than 2.5 years characterizes possible stage 0 Blount's disease, which requires biannual monitoring but does not exclude the possibility of spontaneous resolution, occurring in one case out of three.

Progression toward aggravation and characterization of the metaphyseal beaking, with no epiphysiodesis bridging, confirms stage 1, active physis (+), Blount's disease. However, it is well before the appearance of stage 2, inactive physis (−), with cessation of superomedial growth of the tibia, that valgus derotation osteotomy should be proposed.

Conflicts of interest statement

None.

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